FLANN MICROWAVE INSTRUMENTS LTD.
9 OLD BRIDGE STREET
KINGSTON-ON-THAMES
SURREY

~~T.S. LAB.~~

~~C. QUIRK~~

HANDBOOK FOR S BAND SIGNAL GENERATOR
TYPE 500/II

MP MASTER
MA23421

FLANN MICROWAVE INSTRUMENTS LIMITED.

S BAND SIGNAL GENERATOR TYPE 500/II.

Description

The instrument consists of a heil tube oscillator cavity with its power supply and modulator, a precision piston attenuator and a lowpass filter.

Specification

OSCILLATOR

Frequency range	2.6 - 4.0 Gc/s.
Modulation internal	1:1 square wave.
Modulation frequency (variable)	1-4Kc/s.
Power output (at DIRECT socket) not less than	250mW.

PISTON ATTENUATOR TE_{11}.

Insertion loss (approx.)	12dB.
Attenuation range	0-100dB.
Reading and resetting accuracy	0.02dB.
Accuracy better than	0.1dB.
Power output not less than	2mW.
Output impedance	50 ohms.
Mains input	100-120V 200-250V 40-60 cycles.
Weight	56 lbs.
Size	21" x 18" x 10"

Operating Instructions

1. Check mains voltage settings. (This can be altered on the internal chassis by means of adjustable fuse links.)
2. Connect supply and switch on.
3. Set modulation switch.
4. Set frequency dial.
5. Withdraw Direct output plug if not required.
6. Set Meter ranges and read off resonator volts and resonator current and ensure that these do not exceed 15 watts.
7. Set meter to monitor position and adjust 'screen voltage' control until a deflection is obtained, adjusting 'Detector Sensitivity' control as required.

The supply is now operational. Most of the above steps can be obviated after the first time of usage.

Note: Mains fuses are located in the mains voltage selector panels links, and are obtainable from Messrs. Ariel Pressings Ltd. of Ilkeston, Derbyshire.

Circuit Description

The function of the power supply is to produce a constant wattage to the heil tube irrespective of the frequency setting. It is also required to produce a very stable and highly smoothed D.C. supply to the various electrodes on the heil tube. Both functions are combined in a circuit which closely resembles a typical series parallel stabilised supply. The essential difference is that the power supply senses the current flowing through the valve and adjusts its output voltage in such a way power supplied to the valve is nearly constant at all settings of the frequency control.

To obtain a variable frequency from the heil tube it is necessary to alter its cathode to resonator potential, instep with the dimensions of the cavity this is conveniently obtained by varying the screen voltage which in turn varies the current through the valve and the current supply then automatically alters the resonator to cathode voltage to keep the power constant.

From the circuit diagram it can be seen that in the C.W. position the cathode current through the valve flows through 100 ohm preset potentiometer and then through a 750 ohm resistor. The voltage developed across those two resistors in series has the desired effect of producing a voltage at the grid on the right hand

contd.

side of V.8, in such a way that a constant power, in terms of watts, is supplied to the valve. The normal procedure of obtaining a stable voltage supply as far as variation and mains are concerned is observed here except that the potentimeter which would normally be connected across the whole D.C. supply in this case is returned to the potential at which the cathode of the signal generator is connected to.

The circuit then follows the normally accepted practice of the high gain feed back amplifier featuring the two halves of V8 and V4 of which one half in each is connected as a cathode follower and the other half as a non inverting amplifier. The amplified feed back signal is then applied to the two series valves in parallel V1. and V2. The resulting stability against mains fluctuations both fast and slow is very good. Similarly an extremely small amount of ripple is encountered in the final output. In order to be able to use A.C. amplifiers to detect the R.F. signal the square wave modulation has been added which is applied to the grid of the valve. The grid normally is several volts. negative in respect to the cathode and a swing of some 200 volts coming from V.6. representing a conventional multi-vibrator circuit cuts the valve off completely. Because the circuit is so designed in the first place that the valve should see a constant power supply a further resistor through which the cathode current must pass is now included in the cathode path. This is necessary to keep the levels of D.C. at the same potential when the valve is on, as they would be in the C.W. condition. The D.C. restoring of the square wave is effected by V.7, external modulation facilities are included, these merely apply an external wave form to the grid of the valve and are automatically D.C. restored, in such a way that the wave form cannot rise positive with respect to the cathode.

In order to suppress secondary emission effects which may result if the anode was left at the same potential as the resonator, a small supply has been added which feeds the anode with approximately 6-8 volts D.C. The supply is not stabilised and is derived from a bridge rectifier fed from the same voltage that supplies the heaters of V1 and V2. The supply is smoothed by a single reservoir condenser and fed directly to the anode.

The monitor switch allows the checking of all the potentials such as cathode to resonator, cathode to screen, cathode current and also detector current which may be further adjusted by means of the detector sensitivity control.

The Heil Tube Oscillator

A velocity modulated heil tube type CV 2221 is mounted in a rigorously screened hybrid cavity. Mechanical tuning to the circuit is effected through the directly calibrated frequency dial via a pinion and rack assembly to the tuning piston.

The piston rod is fully choked and leakage suppressed to ensure efficient operation.

Three output points from the cavity are arranged to give attenuated output, direct output and a crystal monitored output (D.C.).

Around the heil tube itself a pre-aligned magnet assembly is situated outside the combined screened and filtered D.C. supply unit. The heil tube itself can be removed without upsetting the magnet alignment.

Positions of piston attenuator and crystal monitor are set at the factory and should not be altered.

Piston Attenuator

The heart of the piston attenuator is an extremely accurate electroformed copper tube that is held to within 0.00005" of its nominal size. The diameter of the cut off tube is arranged such that one revolution of the dial corresponds to exactly 5dB at the design frequency. Small frequency corrections are shown at the end of this manual. Input from the oscillator cavity to this cut-off waveguide is through a Faraday screen mode filter that eliminates the multiplicity of extraneous modes at the orifice.

R.F. power is induced in the matched resistive loop situated in the sliding contact piston head and is coupled to the output point through a 50 ohm co-axial

contd.

cable.

Relative piston position is indicated on a 3" dial where one revolution equals precisely 5dB. Coarse positional steps of each 5dB are shown on a smaller sub-scale.

Heil Tube replacement.

1. Place instrument back to ground.
2. Remove screws securing panel to case, and lift with handles provided carefully ensuring that the case clears all components mounted on the chassis.
3. With suitable support place lower side up.
4. Unscrew the end cap from the heil tube shroud.
5. Take two short 1/8" dia. steel tommy-bars and insert diametrically opposite in the holes provided on the clamping ring just under the magnet assembly and unscrew. Note It is most important that upon re-insertion of the valve that this ring is tightly clamped.
6. Lift assembly gently clear, unplug valve base from heil tube and slide tube clear.
7. On refitting take care that the valve is correctly located on the pins and do not screw lock ring tightly until the dowel pins are engaged with their mating holes.

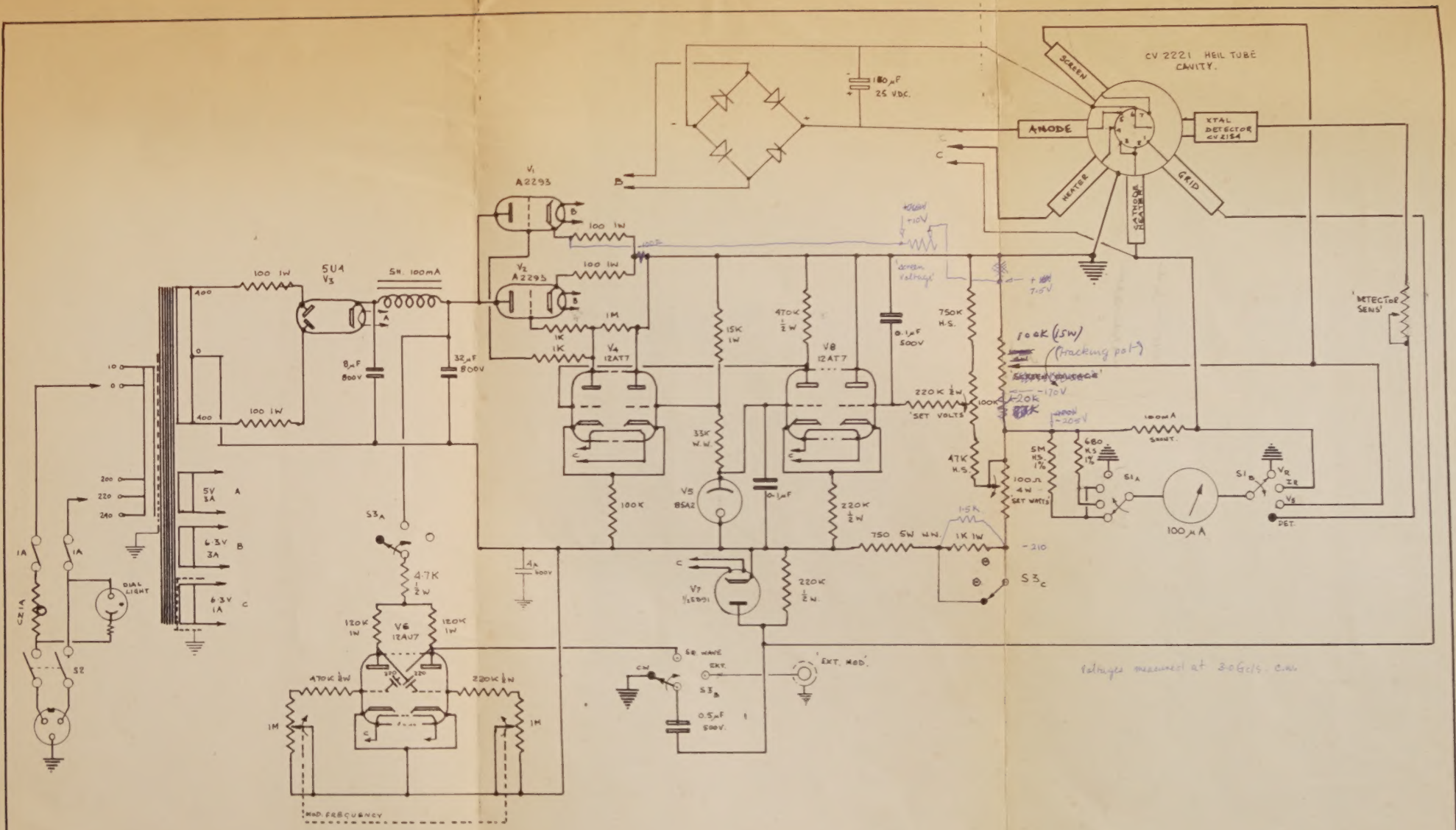
.....

FLANN MICROWAVE INSTRUMENTS LIMITED.
9, Old Bridge Street,
Kingston-on-Thames.

7217

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_05881



issue	date	mod.	details
2	8.3.60	1.	REDRAWN STABILISER CIRCUIT MOD.

DRN. M.A.L.
TRC'D ~~B.F.~~
CH'K
APP'D

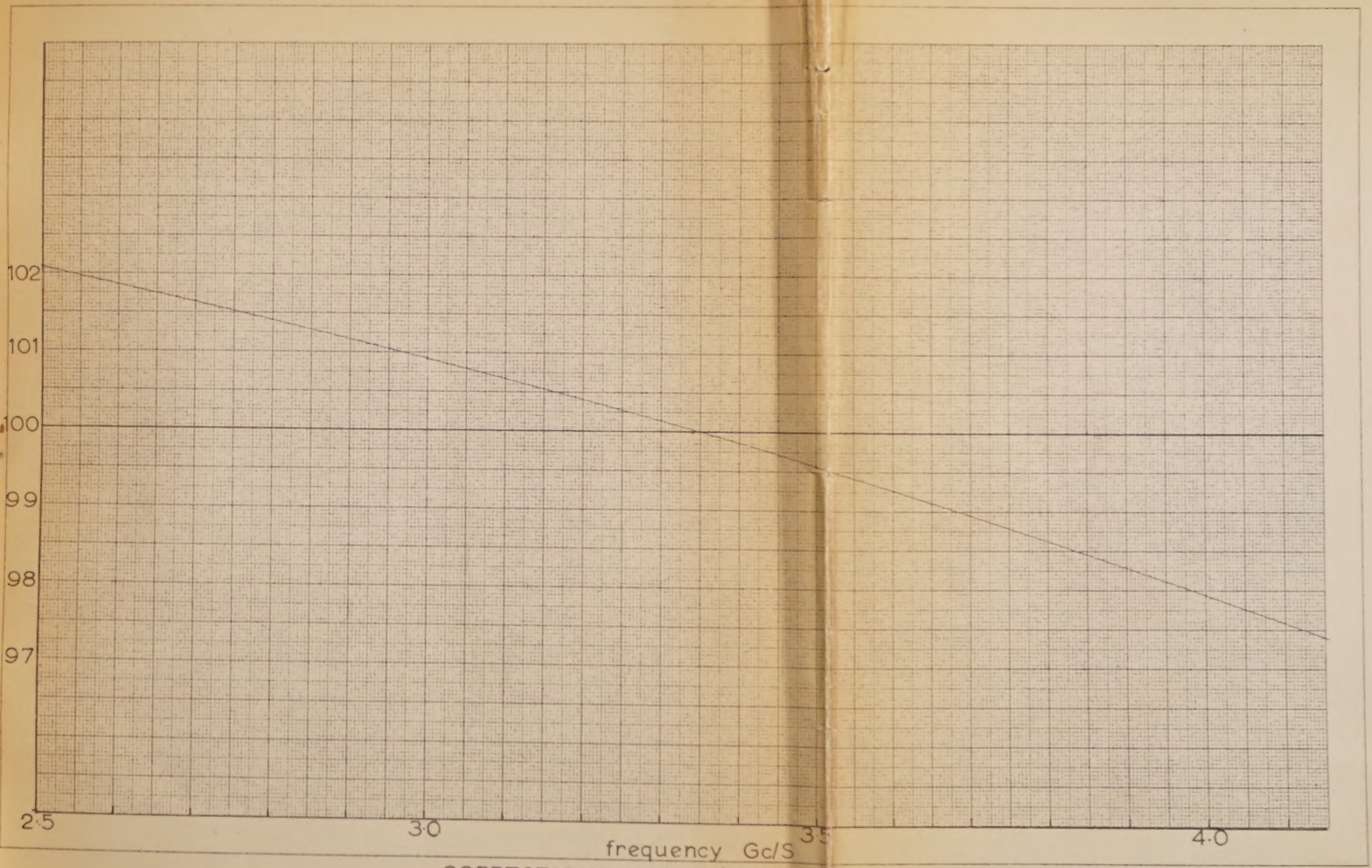
FLANN MICROWAVE INSTRUMENTS LIMITED

'S' BAND SIGNAL GENERATOR
15 WATT SUPPLY

drawing no.
B/FL.500/2.D

SHEET

FOLD
FOLD
FOLD
FOLD



CORRECTIONS PISTON ATTENUATOR

MP MASTER
MA23421